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| 10/815,976 | 04/02/2004 | Atsushi Fukui | BJS-900-495 | 7726 |
| 23117 7590 10/29/2010 NIXON & VANDERHYE, PC 901 NORTH GLEBE ROAD, 11TH FLOOR ARLINGTON, VA 22203 | | | | |
| EXAMINER | | | | |
| TRINH, THANH TRUC | | | | |
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/815,976

Applicant(s)

FUKUI ET AL.

Examiner

THANH-TRUC TRINH

Art Unit

1725

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 July 2010.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 39-46 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 39-46 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/CD)
Paper No(s)/Mail Date 10/14/2010
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(c), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(c) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 7/29/2010 has been entered.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 39-46 are rejected under 35 U.S.C. 102(b) as being anticipated by Yoshikawa (US 2002/0040728).

Regarding claims 39, 42 and 46, as seen in Figure 1, Yoshikawa discloses a dye-sensitized solar cell comprising:

- a transparent conductive layer (10),
- a porous semiconductor of titanium oxide (20) on which a dye sensitizer (22) is adsorbed,
- a carrier transport layer (30) and

Art Unit: 1725

- a counter electrode (40) which are formed in this order on a transparent substrate (50). (See paragraphs [0069] and [0074]-[0111]).

Yoshikawa also teaches the dye-sensitized semiconductor is subjected to a chemical treatment with alkylated imidazole salt (see paragraphs [0027]-[0067], formulae I-26, I-28, II-18, II-19; ethylimidazole, ethylmethyylimidazolium salt as described in paragraph 0056). In addition, the claimed limitations describing steps to treat the porous semiconductor layers such as chemical treatment carried out by immersing the porous semiconductor layer in a solution is a process limitation that does not add any structural limitations to the claimed device and thus are not given weight in the apparatus claim. The determination of patentability is based on the product itself, not on its method of production. See MPEP 2113.

Regarding claim 40, Yoshikawa discloses a dye-sensitized solar cell as described in claim 39 above. A recitation of a volume of a solution for treating the semiconductor layer of the solar cell, wherein the treatment is a process limitation, does not add any structural limitations to the claimed device (e.g. the dye-sensitized solar cell) and thus are not given weight in the apparatus claim. The determination of patentability is based on the product itself, not on its method of production. See MPEP 2113. Yoshikawa discloses all the structural limitations of the claimed solar cell (e.g. a transparent conductive layer, a porous semiconductor layer with a dye-sensitizer adsorbed thereon, a carrier transport layer, and a counter electrode formed on a transparent substrate), therefore the reference is deemed to be anticipatory.

Regarding claim 41, Yoshikawa discloses a dye-sensitized solar cell as described in claim 39 above, wherein Yoshikawa further describes the dye sensitizer comprising a

Art Unit: 1725

compound of cis-bis(isothiocyanato)bis(2,2'-bipyridyl-4,4'-dicarboxylato)ruthenium (II) (see formula (III) and R1 in paragraph 0111).

Regarding claim 43, Yoshikawa discloses a dye-sensitized solar cell as described in claim 39 above. Yoshikawa also teaches the chemical treatment is carried out for 30 seconds to 24 hours (see paragraph 0054). However, a recitation of chemical treatment carried out by immersing the porous semiconductor layer in a solution for 1 minute to 30 hours is a process limitation that does not add any structural limitations to the claimed device and thus are not given weight in the apparatus claim. The determination of patentability is based on the product itself, not on its method of production. See MPEP 2113. Yoshikawa discloses all the structural limitations of the claimed solar cell (e.g. a transparent conductive layer, a porous semiconductor layer with a dye-sensitizer adsorbed thereon, a carrier transport layer, and a counter electrode formed on a transparent substrate), therefore the reference is deemed to be anticipatory.

Regarding claim 44, Yoshikawa discloses a dye-sensitized solar cell as described in claim 39 above. Yoshikawa also teaches the concentration of the salt in solution is to be 1×10^{-5} to 2 mol/L or 1×10^{-5} to 5×10^{-1} mol/L, (see paragraphs 0057 and 0067). However, a recitation of concentration of a solution used for treating the semiconductor does not add any structural limitations to the claimed device and thus are not given weight in the apparatus claim. The determination of patentability is based on the product itself, not on its method of production. See MPEP 2113. Yoshikawa discloses all the structural limitations of the claimed solar cell (e.g. a transparent conductive layer, a porous semiconductor layer with a dye-sensitizer adsorbed thereon, a carrier transport

layer, and a counter electrode formed on a transparent substrate), therefore the reference is deemed to be anticipatory.

Regarding claim 45, Yoshikawa discloses a dye-sensitized solar cell as described in claim 39 above. Yoshikawa also teaches the solution for treating the semiconductor comprising an alcohol type solvent, a nitrile type solvent and a non-protonic solvent (e.g. dichloromethane, dichloroethane..., see paragraphs 0052, 0060). However, a recitation of a solvent of a solution used for treating the semiconductor does not add any structural limitations to the claimed device and thus are not given weight in the apparatus claim. The determination of patentability is based on the product itself, not on its method of production. See MPEP 2113. Yoshikawa discloses all the structural limitations of the claimed solar cell (e.g. a transparent conductive layer, a porous semiconductor layer with a dye-sensitizer adsorbed thereon, a carrier transport layer, and a counter electrode formed on a transparent substrate), therefore the reference is deemed to be anticipatory.

Response to Arguments

4. Applicant's arguments and declaration filed 11/30/2010 have been fully considered but they are not persuasive.

Declaration under 37 C.F.R. 1.132

Applicant compares Applicant's chemical treatment using a solution of acetonitrile and dimethylpropylimidazolium iodide and Yoshikawa's chemical treatment (described as after-treatment) using a solution of acetonitrile and t-butyl pyridine. Applicant describes two solutions were used:

Art Unit: 1725

1) Organic Molecule Solution (used for Applicant's invention): acetonitrile solution of 0.2 M dimethylpropylimidazolium iodide.

2) Electrolytic Solution (or Yoshikawa's): acetonitrile solution of 0.8 M dimethylpropylimidazolium iodide, 0.1 M lithium iodide and 0.1 M iodine.

Applicant further describes Yoshikawa's solar cell to an "after-treatment" by infiltrating the dye-sensitizer-adsorbed semiconductor layer with electrolytic solution using a capillary phenomenon, and according to claims 7, 8 and 11 of Yoshikawa.

Applicant argues that the claimed invention chemical treatment using the organic molecule solution only comprising alkylated imidazole salts as a solute is more superior over Yoshikawa using electrolytic solution comprising alkylated imidazole salts and other types of electrolytic solution.

However, the declaration under 37 CFR 1.132 filed 6/10/2010 is insufficient to overcome the rejection of claims 39-46.

First of all, newly submitted claims are rejected under 35 U.S.C. 102(b). That is, all the structural limitations of the claimed dye-sensitized solar cell are taught by Yoshikawa and there is no difference between Applicant's claimed invention and Yoshikawa's.

Secondly, the Examiner fails to see what comparisons were made and table A shows the result of what comparison, as first Applicant states comparing Applicant's chemical treatment using acetonitrile and dimethylpropylimidazolium iodide to Yoshikawa's chemical treatment using acetonitrile and t-butyl pyridine, then later Applicant describes comparing Applicant's chemical treatment using the "organic molecule solution" to Yoshikawa's chemical treatment using the "electrolytic solution."

Art Unit: 1725

The Examiner also wants to point out that acetonitrile and t-butyl pyridine are not the main components or chemical compounds being used for treating the porous semiconductor disclosed by Yoshikawa, and electrolytic solution is not the same as the solution used to treat the porous semiconductor in Yoshikawa (see the entire document of Yoshikawa, especially the examples as Yoshikawa describes treating the semiconductor electrode before the production of photoelectric conversion device by introducing electrolysis solution). Acetonitrile and t-butyl pyridine are solvent and optional additive, respectively.

Thirdly, the declaration refers only to the system described in the above referenced application and not to the claims of the application as none of the claim recites using 0.2 M dimethylpropylimidazolium iodide. To be given substantial weight in the determination of obviousness or nonobviousness, evidence of secondary considerations must be relevant to the subject matter as claimed, and therefore the examiner must determine whether there is a nexus between the merits of the claimed invention and the evidence of secondary considerations. *Ashland Oil, Inc. v. Delta Resins & Refractories, Inc.*, 776 F.2d 281, 305 n.42, 227 USPQ 657, 673-674 n. 42 (Fed. Cir. 1985), *cert. denied*, 475 U.S. 1017 (1986). The term "nexus" designates a factually and legally sufficient connection between the objective evidence of nonobviousness and the claimed invention so that the evidence is of probative value in the determination of nonobviousness. *Demaco Corp. v. F. Von Langsdorff Licensing Ltd.*, 851 F.2d 1387, 7 USPQ2d 1222 (Fed. Cir.), *cert. denied*, 488 U.S. 956 (1988). See MPEP 716.01(b). Applicant fails to make a sufficient connection between the objective evidence of nonobviousness and the claimed invention. As such the declaration does not show that

Art Unit: 1725

the objective evidence of nonobviousness is commensurate in scope with the claims.

Whether the unexpected results are the result of unexpectedly improved results or a property not taught by the prior art, the "objective evidence of nonobviousness must be commensurate in scope with the claims which the evidence is offered to support." In other words, the showing of unexpected results must be reviewed to see if the results occur over the entire claimed range. *In re Clemens*, 622 F.2d 1029, 1036, 206 USPQ 289, 296 (CCPA 1980) (Claims were directed to a process for removing corrosion at "elevated temperatures" using a certain ion exchange resin (with the exception of claim 8 which recited a temperature in excess of 100C). Appellant demonstrated unexpected results via comparative tests with the prior art ion exchange resin at 110C and 130C. The court affirmed the rejection of claims 1-7 and 9-10 because the term "elevated temperatures" encompassed temperatures as low as 60C where the prior art ion exchange resin was known to perform well. The rejection of claim 8, directed to a temperature in excess of 100C, was reversed.). See also *In re Peterson*, 315 F.3d 1325, 1329-31, 65 USPQ2d 1379, 1382-85 (Fed. Cir. 2003) (data showing improved alloy strength with the addition of 2% rhenium did not evidence unexpected results for the entire claimed range of about 1-3% rhenium); *In re Grasselli*, 713 F.2d 731, 741, 218 USPQ 769, 777 (Fed. Cir. 1983) (Claims were directed to certain catalysts containing an alkali metal. Evidence presented to rebut an obviousness rejection compared catalysts containing sodium with the prior art. The court held this evidence insufficient to rebut the *prima facie* case because experiments limited to sodium were not commensurate in scope with the claims.). See MPEP 716.02(d).

Fourthly, Applicant fails to compare the claimed invention with the closest subject matter that exists in the prior art as Yoshikawa teaches t-butyl pyridine is the additive, not the actual chemicals for treating the semiconductor layer. The actual chemicals for treating semiconductor layer are compounds I and compounds II (See paragraphs 0025-0026 of Yoshikawa). The "organic molecule solution" is not in any of instant claims, especially the concentration of dimethylpropylimidazolium; and the "electrolytic solution" used for Yoshikawa's is not what Yoshikawa discloses for the chemical treatment solution, not even for the actual electrolysis solution disclosed by Yoshikawa. Applicant states that the treatment was carried out according to claims 7, 8 and 11 of Yoshikawa. However, in claims 7, 8 and 11, Yoshikawa discloses a general formula which includes imidazolium ion. A general formula of Yoshikawa contains multiple molecular structures. The Examiner is not sure what molecular structure (or chemical compound) in the general formula of claims 7, 8 and 11 of Yoshikawa did Applicant use for the comparison. There is only one result from the table A, while claims 7, 8 and 11 of Yoshikawa contain multiple treatments. Applicant has not explained why there is only one result for multiple treatments. Applicant also fails to indicate exactly which treatment was used. Evidence of unexpected properties may be in the form of a direct or indirect comparison of the claimed invention with the closest prior art which is commensurate in scope with the claims. See *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980) and MPEP § 716.02(d) - § 716.02(e). See MPEP 716.02(b). An affidavit or declaration under 37 CFR 1.132 must compare the claimed subject matter with the closest prior art to be effective to rebut a *prima facie* case of obviousness. *In re Burckel*, 592 F.2d 1175, 201 USPQ 67 (CCPA 1979). "A comparison of the *claimed* invention

Art Unit: 1725

with the disclosure of each cited reference to determine the number of claim limitations in common with each reference, bearing in mind the relative importance of particular limitations, will usually yield the closest single prior art reference." *In re Merchant*, 575 F.2d 865, 868, 197 USPQ 785, 787 (CCPA 1978) (emphasis in original). Where the comparison is not identical with the reference disclosure, deviations therefrom should be explained, *In re Finley*, 174 F.2d 130, 81 USPQ 383 (CCPA 1949), and if not explained should be noted and evaluated, and if significant, explanation should be required. *In re Armstrong*, 280 F.2d 132, 126 USPQ 281 (CCPA 1960) (deviations from example were inconsequential). See MPEP 716.02(e).

In view of the foregoing, when all of the evidence is considered, the totality of the rebuttal evidence of nonobviousness fails to overcome the obviousness and the rejection. Again, the rejection is under 102(b), and NOT under 103. Rebuttal evidence of nonobviousness cannot overcome a rejection under 102(b).

Arguments filed 6/10/2010

Applicant argues that the instant claims are neither anticipated by nor obvious over Yoshikawa because Yoshikawa does not disclose the features of the claimed invention such that the chemical treatment is carried out by immersing the dye sensitizer-adsorbed porous semiconductor layer in the solution comprising alkylated imidazole salts. However, Applicant's argument is not deemed to be persuasive. Chemically treating the dye sensitizer-adsorbed porous semiconductor layer is a product-by-process limitation, such limitation does not add any structural limitations to the claimed device and thus are not given weight in the apparatus claim. The determination of patentability is

Art Unit: 1725

based on the product itself, not on its method of production. See MPEP 2113.

Furthermore, Yoshikawa does anticipate the instant claims (see the rejection above) and Yoshikawa does disclose immersing the dye sensitizer-adsorbed porous semiconductor layer in the solution comprising alkylated imidazole salts (see paragraphs 0025-0067, it is noted that “dipping” is the same as “immersing”).

Applicant also argues the declaration shows the dye-sensitized solar cell of the claimed invention is superior in cell characteristics to the photoelectric conversion device of Yoshikawa. However, the Examiner respectfully disagrees. Newly submitted claims are rejected under 102(b). See the rejection above. A declaration is only for overcoming a rejection of obviousness. In addition, the declaration also fails to overcome an obviousness rejection as explained above.

Conclusion

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to THANH-TRUC TRINH whose telephone number is (571)272-6594. The examiner can normally be reached on 8:30 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Basia Ridley can be reached on 571-272-1453. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

TT
10/21/2010

/Basia Ridley/
Supervisory Patent Examiner, Art Unit 1725